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Male Genitalic illustrations and notes on the Larentiinae (Geometridae) of Missouri[1]

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Abstract.—Male genitalic illustrations of 28 species are presented. Eleven of these have never been illustrated before. Another 9 replace inadequate or partial illustrations. The remaining 8 show individual or geographic variation. The male genitalia of 4 species and the female genitalia of 17 species are described for the first time. New state species distribution records and new synonymies are also presented. Species treated and recorded as captured in Missouri total 36 in number.

This is one of several articles (Heitzman and Enns, 1977, 1978) based on a review of the Missouri Larentiinae. These should be consulted for information on state distributions, flight periods, larval plants, new nomenclature combinations, keys, adult illustrations and explanatory figures.

The taxonomic importance of the genitalia has stood the test of time as one of the best means of separating species of Lepidoptera. Many groups would still be hopelessly confused if it were not for the presence of diagnostic genitalic characters which have so often led to the discovery of other, more subtle, characters. In the Larentiinae, the large genera *Hydriomena* and *Eupithecia* are 2 excellent examples. Genitalia are useful for distinguishing species and genera but often not much help at subfamily or family levels. Their potential for grouping higher categories has often been investigated. Many similar-looking genital structures have envolved again and again independently, and this can be very deceptive. It is the instability of these characters that has made them so very useful for distinguishing closely related species. There are those who will contend that the external genitalic structure is but a pleiotropic by-product of the genes, but the genitalic similarities and stability of structure usually run parallel to other characters examined between close taxa in the Geometridae. There appears to be a great deal of inconsistency in the artifical grouping of the Larentiinae, particularly on the generic level, even when other characters are taken into account. This is probably true for most groups of Lepidoptera.

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The genitalic terminology employed here basically follows that of Pierce (1914). Unless otherwise stated, genitalic descriptions are based on Missouri specimens. All illustrations are of Missouri specimens.

The illustrations are intended to be accurate representations, and were made with the aid of a microprojector (WILD M5-Zeichentubus®). The genitalic drawings show the ventral view, except for the aedeagus which is usually shown in its dextral aspect. All drawings were made by the senior author.

Xanthorhoe lacustrata (Guenee) (Fig. 1)

Forbes (1948, Fig. 156) illustrated the value of the male genitalia of *lacustrata.* It is without accompanying data, and shows minor variation in comparison to Missouri specimens. Both the valvula and costa are shaped differently.

Female with ostium wide; operculum scobinate; bursa copulatrix globular, with oblong signum; neck of bursa long.

Earophila multiferata (Walker) (Fig. 2)

Euphyia multiferata, Heitzman, 1973.

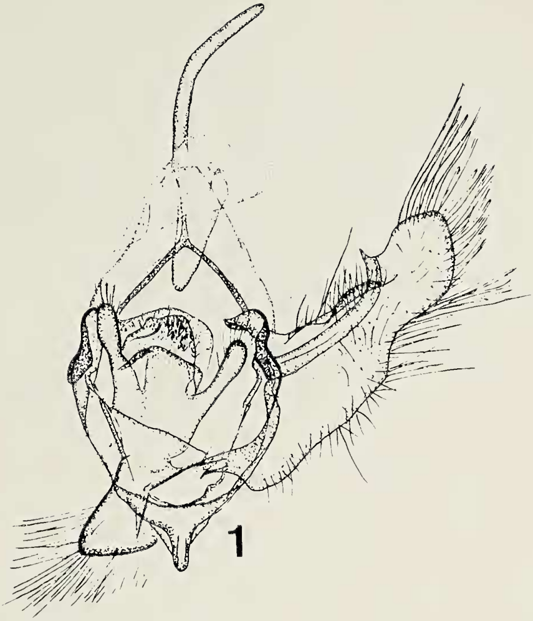
Apparently, the male genitalia of this species have not been illustrated before. A comparison of the species with *vasiliata* (Guenee), *switzeraria* (Wright), and *pectinata* (Rindge) in Rindge's 1967 revision reveals numerous differences. In *multiferata* the valve is stouter, the juxta is basally bilobed, cristae are present, the transtilla lobes are larger, and the costa does not end in a free spine.

Female with ostium wide, funnel-shaped, sclerotized on venter; ductus bursae short, with a sclerotized collar open on venter; ductus seminalis small, arising at base of collar; bursa copulatrix large, membranous irregular, with several lobes; signum an irregular, heavily sclerotized plate on left side near middle.

Euphyia centrostrigaria (Wollaston) (Fig. 3)

Apparently, the male genitalia of this species have not been illustrated before. The clasping unit is unusual in that the valves arise so low and the uncus has a dorsally directed curvature.

Female with ostium very wide, funnel-shaped, sclerotized; ductus bursae heavily sclerotized, rather wide, long; bursa copulatrix membranous, globular.



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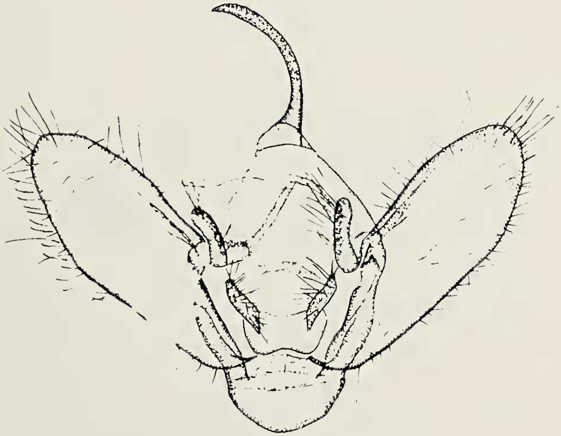

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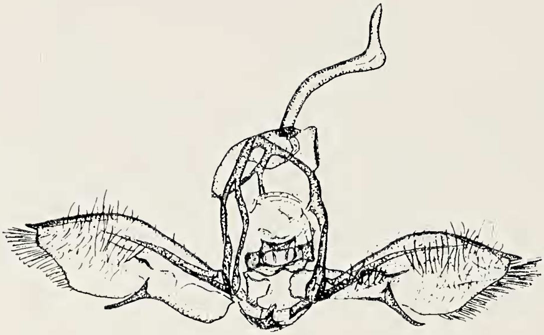
Fig. 1 — *Xanthorhoe lacustrata* (Guenee)
Fig. 2— *Earophila multiferata* (Walker)



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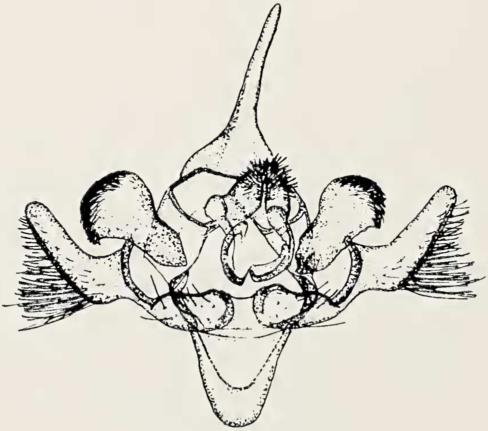

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Fig. 3 — *Euphyia centrostrigata* (Wollaston)
Fig. 4 — *Orthonama obstipata* (Fabricius)

Orthonama obstipata (Fab.) (Fig. 4)

Nycterosea obstipata, Heitzman, 1973.

The male genitalia were illustrated before by Pierce (1914, Pl. 47). Unfortunately, no data are associated with this figure. The discrepancies between his illustration and ours are almost incredible. There is a great need to look at a lot of material from all over the world to see how many species are really involved. Considering the worldwide distribution of this species, it could possibly be explained away as a phenomenon of inter-population variation. However, we strongly suspect that two or more species are involved, unless his illustration is inaccurate or based on a mutation. The genitalia are highly modified leaving the homologies uncertain.

Camptolina stellata (Guenee)

Apparently, the male genitalia of this species have not been illustrated or completely described. The following description of the male genitalia is based on Louisiana specimens:

Uncus short, bilobed, with sparse setae; anal tube strong, with a pair of mildly sclerotized rods; anellus lobes long, with many setae at tips; juxta bifid, with setae; saccus extended, triangular; valve narrow at base, expanded at apex; sacculus enlarged, heavily sclerotized, with a short, cephalad projection at base, a long, narrow process distally; valvula membranous, with setae thick on upper half; costa normal; aedeagus long, extremely narrow, with 2 long, weak cornuti and a scobinate tip.

Female with ostium wide, funnel-shaped; ductus bursae extremely long, narrow, sclerotized; bursa copulatrix a large, membranous sack with a stellate signum possessing 7 large spines.

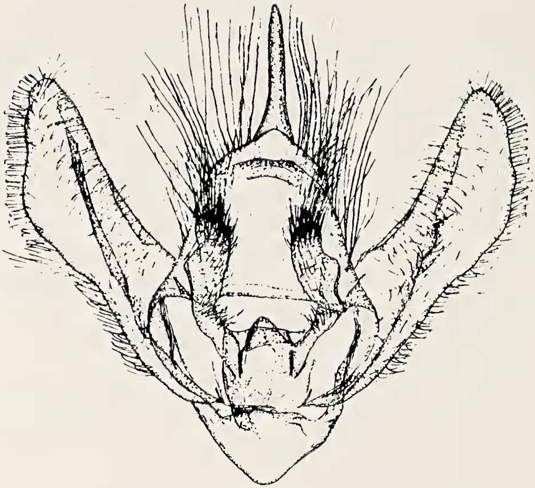
Venusia comptaria Walker (Fig. 6)

Apparently, the male genitalia of this species have not been illustrated before. The genitalia appear nearly identical to *Hydrelia inornata* (Hulst) except that the annellus lobes are lacking.

Female with ostium small, sclerotized; ductus bursae very long, narrow, heavily sclerotized, bursa copulatrix ovular to globular, membranous, with an elongate signum near neck on venter, rest of bursa with very fine spines.

Hydrelia inornata (Hulst)

The male genitalia are almost identical with *Venusia comptaria* Walker except for the presence of long, narrow annellus lobes that curl



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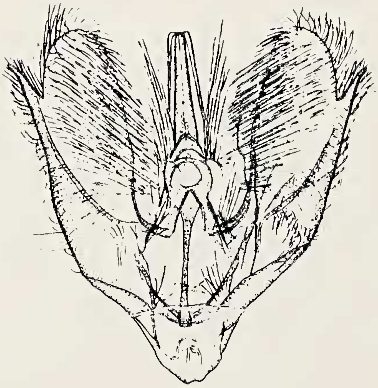

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Fig. 5 — *Trichodezia albovittata* Warren
Fig. 6 — *Venusia comptaria* Walker

laterad and have short setae mesally. The aedeagi of both species are long and narrow without cornuti.

Female with ostium wide, funnel-shaped, sclerotized laterally; ductus bursae fairly long, heavily sclerotized, but with a membranous ring in middle; bursa copulatrix large, membranous, with a stellate signum on venter near middle and a small patch of spines on dorsum near neck.

This species was previously recorded as far west and south as Kentucky. It has been taken recently in several eastern Missouri counties.

Hydrelia albifera (Walker)

Female with ostium wide, funnel-shaped; ductus bursae very long, lightly sclerotized, with a distal collar; bursa copulatrix oval, bulging to left, with a large, ovate patch of spines on distal right and wide bar of spines on proximal left.

This species was previously recorded as far south as Pennsylvania. A single fresh female specimen was recently taken in west central Missouri. The *Hydrelia albifera* of the 1973 checklist referred to a *Metasiopsis* sp.

Trichodezia albovittata Warren (Fig. 5)

Apparently, the male genitalia of this species have not been illustrated before. The aedeagus is large with numerous cornuti.

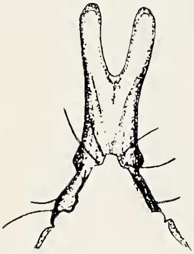
Female with ostium wide, sclerotized; ductus bursae short, membranous; bursa copulatrix huge, elongate, sclerotized, covered with minute spines; signum an arrowhead-shaped plate on venter near middle, pointing distally, resting on proximal end.

Hydriomena bistriolata Zeller (Fig. 9)

McDunnough (1954) has already adequately described and illustrated the genitalia of both sexes of the Nearctic *Hydriomena* species. Our illustrations show only minor variation in uncal shapes and setal arrangements, which probably fall within the bounds of individual variation.

Hydriomena mississippiensis McDunnough (Fig. 8)

There is little evidence for the specific status given this taxon. McDunnough (1952) did not acknowledge the affinities of *mississippiensis* to *bistriolata* Zeller, and presented no satisfactory differences. The minor differences in the uncus do not correspond to any unique external characters. The bursa of the female holotype of *bistriolata* is twisted and distorted.



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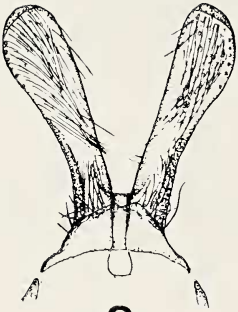

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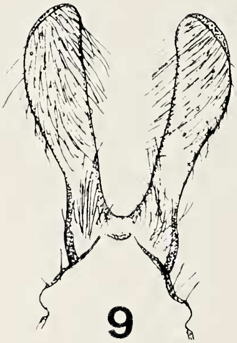

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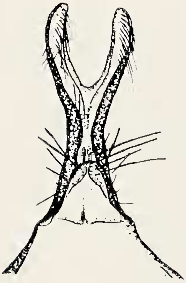

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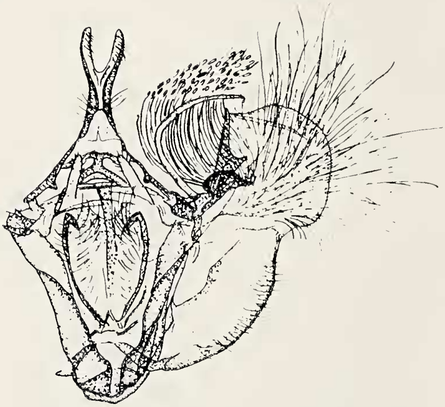

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Fig. 7 — *Hydriomena pluviata meridianata* McDunnough
Fig. 8 — *H. mississippiensis* McDunnough
Fig. 9 — *H. bistriolata* Zeller
Fig. 10, 11 — *H. transfigurata manitoba* Barnes and McDunnough

Hydriomena pluviata meridianata McDunnough (Fig. 7)

All Missouri specimens examined posses the lateral protuberances at the base of the uncus and the uncal forks are always naked.

Hydriomena transfigurata manitoba Barnes & McDunnough (Figs. 10, 11)

Hydriomena transfigurata, Heitzman, 1973.

This subspecies always has setae on the venter of the uncal forks. McDunnough (1954, Fig. 50) apparently omited this character.

Hydria prunivorata (Ferguson) (Fig. 12)

The male genitalia of this species were previously illustrated by Ferguson (1955, Fig. 1) from New York. Our illustration varies to some degree in most characters, the form of the juxta varying the most.

Coryphista meadi (Packard) (Fig. 13)

Apparently, the male genitalia of this species have not been illustrated before. The genitalia are very similar to those of *Hydria prunivorata* (Ferguson).

Female with ostium small, funnel-shaped; ductus bursae long, with some variable spining; bursa copulatrix a small, membranous sack with an oval signum.

Rheumaptera hastata (L.) (Fig. 14)

The male genitalia of this species were previously illustrated by McGuffin (1973, Fig. 57a-d). Our illustration varies to some degree in most characters, the form of the juxta and the length of the sacculus process varying the most.

Ecliptopera atricolorata (Grote & Robinson) (Fig. 16)

Diactinia atricolorata, Heitzman, 1973.

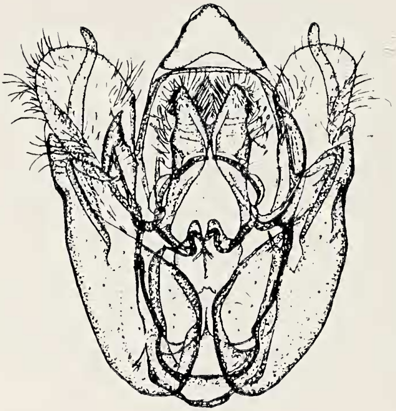
Apparently, the male genitalia of this species have not been illustrated before. The aedeagus is stout, with a band of small cornuti.

Female with ostium weak; ductus bursae short, membranous; bursa copulatrix large, oblong, with an irregular, scotinate signum.

Archirhoe neomexicana (Hulst)

Apparently, the male genitalia of this species have not been described before. The following description of the male genitalia is based on the examination of Arizona specimens:

Uncus long, narrow, apex expanded, with many short setae; anal tube wih broad sclerotization; transtilla expanded medially; manica heavily



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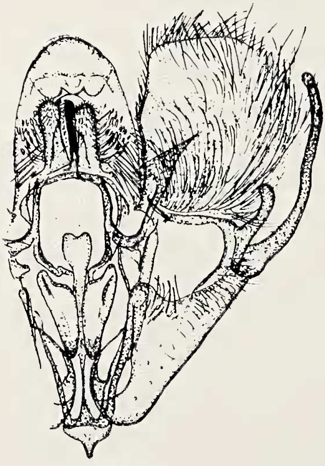

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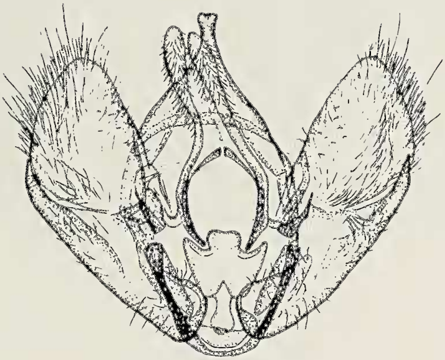
Fig. 12 — *Hydria prunivorata* (Ferguson)
Fig. 13 — *Coryphista meadi* (Packard)



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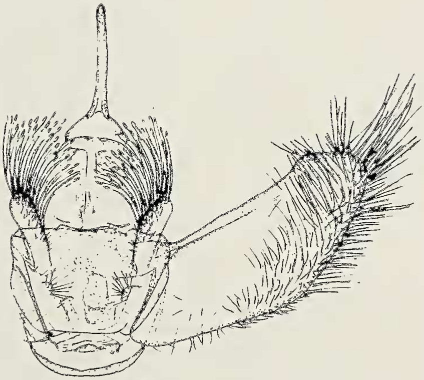

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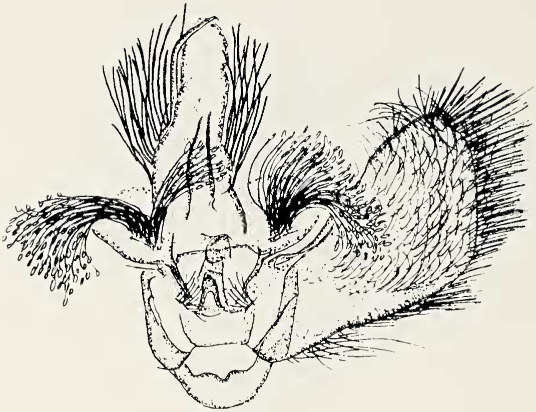
Fig. 14 — *Rheumaptera hastata* (Linnaeus)
Fig. 15 — *Eulithis diversilineata* (Hubner)



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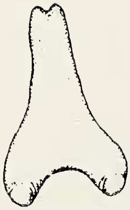

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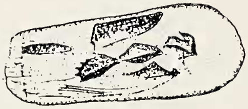

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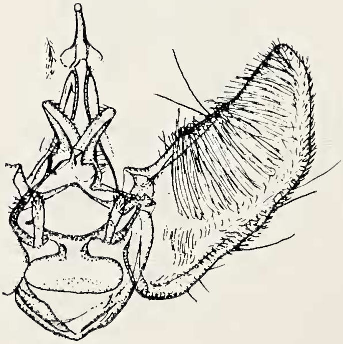

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Fig. 16 — *Ecliptopera atricolorata* (Grote and Robinson)
Fig. 17-19 — *Eupithecia geminata* Packard

spined; anellus lobes short, tipped with long setae; juxta plate V-shaped posteriorly, with lateral arms anteriorly; saccus small, thick, tapering to a point; sacculus enlarged, heavily sclerotized, curling over base of central framework; valvula reduced, membranous, with many long setae, particularly on outer edge; costa thick, heavily sclerotized, with a long, pointed process, thickened at its middle; aedeagus long, curved; opening large, rugose, vesica with about 6 cornuti on 1 side, and 2 larger ones on other side; coremata very large.

Female with ostium funnel-shaped, rugose, membranous, with sclerotized, lateral pieces; ductus bursae with long, sclerotized collar open on venter; bursa copulatrix large, membranous, without signum.

This southern species has not previously been recorded from Missouri.

Eulithis diversilineata (Hubner) (Fig. 15)

Lygris diversilineata, Heitzman, 1973.

Apparently, the male genitalia of this species have not been illustrated before. The aedeagus is simple, without cornuti. The only consistent difference we can find in the genitalia between this species and *E. gracilineata* (Guenee) is the more lightly sclerotized genitalia of *diversilineata.*

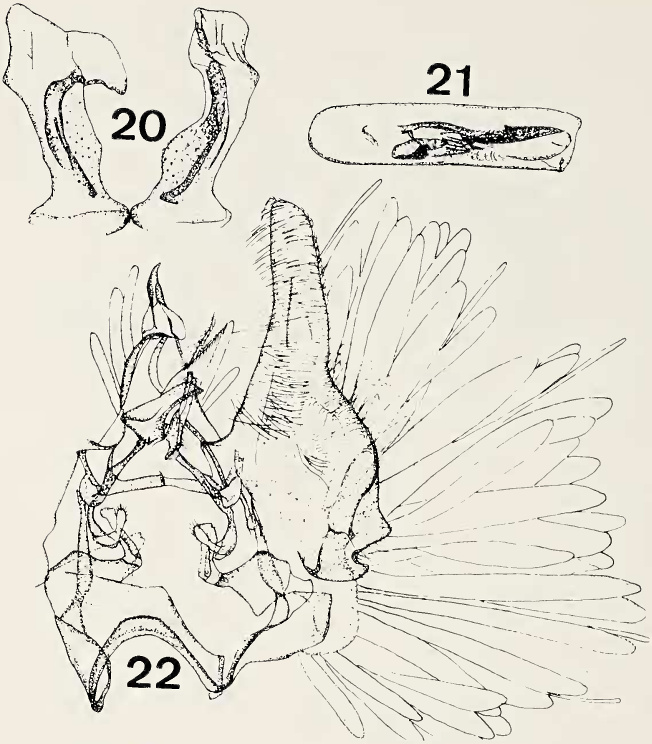
Female apophyses weak; ostium weak; ductus bursae rather short, with a long sclerotized collar open on dorsum; bursa copulatrix large, peanut-shaped; signum a thin, finely spinose line on proximal half of right side; ductus seminalis small, arising on neck just above signum on right side.

Eulithis gracilineata (Guenee)
Lygris gracilineata, Heitzman, 1973.

The genitalia of this species vary from *diversilineata* (Hubner) only in being more heavily sclerotized. There is no solid evidence favoring the validity of these two taxa being treated as species.

Eupithecia miserulata Grote (Figs. 20-22)

The genitalia of most of the Nearctic species of this genus have been previously illustrated by McDunnough (1949); however, of the clasping unit he only outlined the valve. We have noted that the species also vary in the formation of the saccus and the labidal pads and papillae. The shape of the valve varies considerably within a given species and is not generally a reliable character. There appears to be some individual variation in nearly all characters.



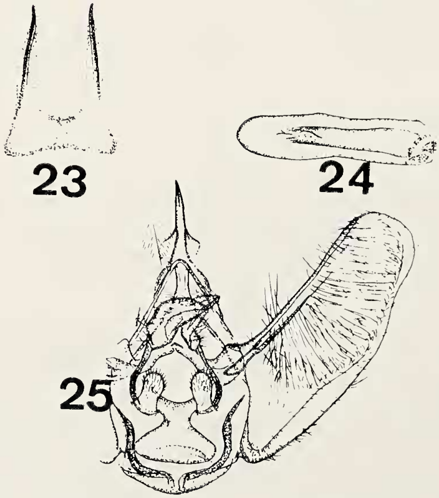
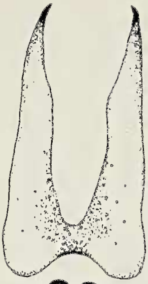


Fig. 20-22 — *E. miserulata Grote*
Fig. 23-25 — E. rindgei McDunnough



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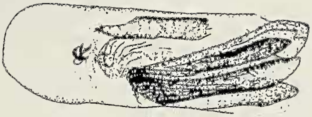

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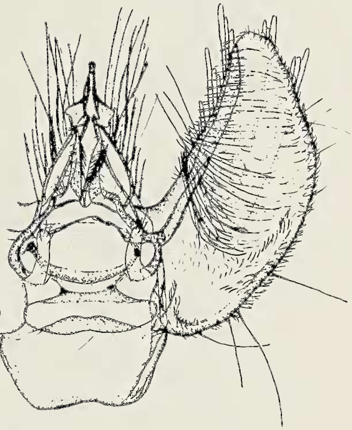

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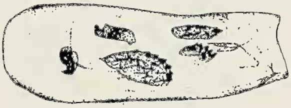

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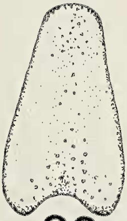

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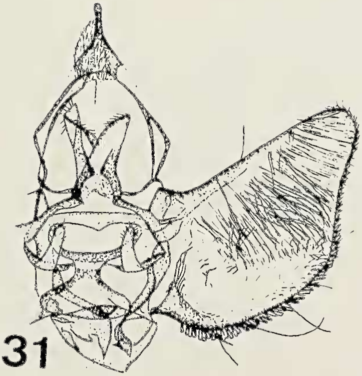

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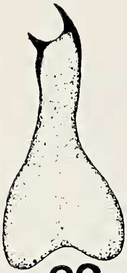
Fig. 26-28 — *E. herefordaria* Cassino and Swett
Fig. 29-31 — *E. swetti* Grossbeck



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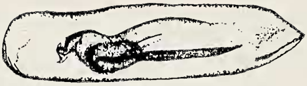

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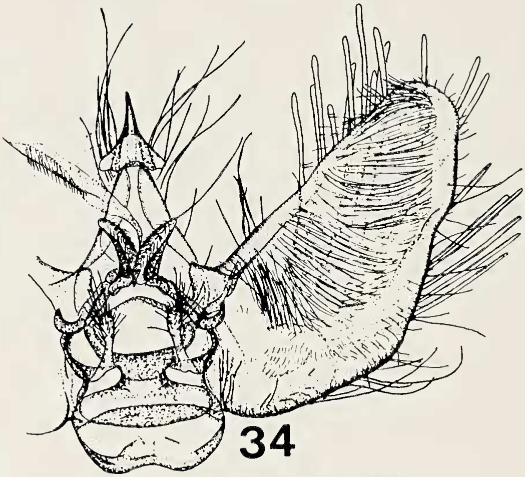

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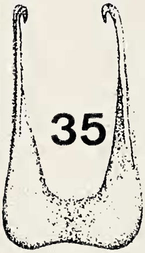

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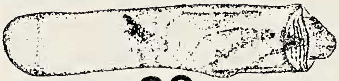

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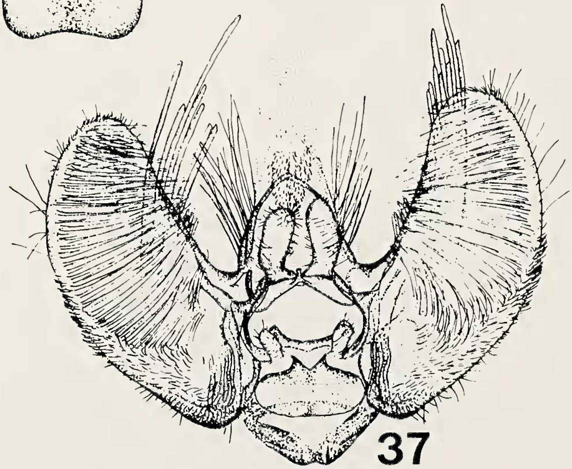

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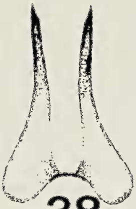
Fig. 32-34—*E. fletcherata* Taylor
Fig. 35-37—*E. coloradensis* (Hulst)



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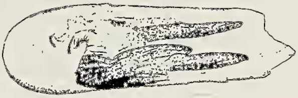

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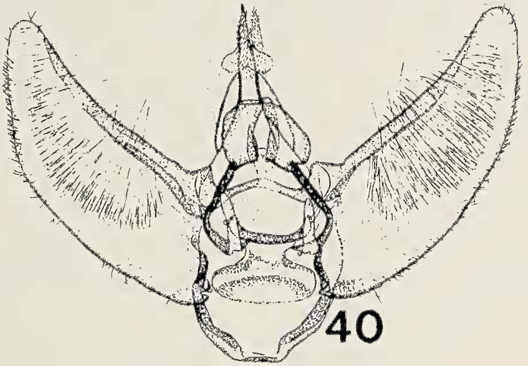

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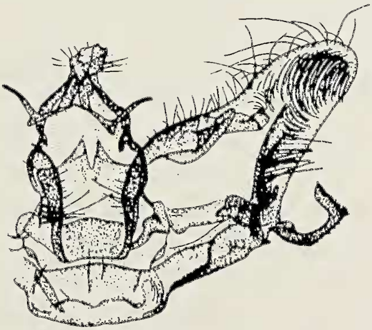

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Fig. 38-40—*E. jejunata* McDunnough
Fig. 41—*Horisme intestinata* (Guenee)

In *miserulata,* McDunnough's illustration (loc cit., Fig. 4A) of the eighth sternite lacks the deeply sclerotized pieces found in the rods.

Eupithecia jejunata McDunnough (Figs. 38-40)

The eighth sternite and aedeagus were illustrated by Rindge (1956, Figs. 1, 2). The clasping unit has not been illustrated before.

This species has previously been recorded from only 4 southern states. Lewis Co., Missouri (northeast section) now becomes the northernmost point of its range.

Eupithecia fletcherata Taylor (Figs. 32-34)

The eighth sternite illustrated by McDunnough (1949, Fig. 5E) differs somewhat in shape and lacks the heavy sclerotization of the claws.

Western Missouri is a considerable extension in the previously recorded range of *fletcherata.* It was last recorded only so far southwest as Pennsylvania.

Eupithecia peckorum Heitzman & Enns

Eupithecia palpata, Heitzman, 1973.

The genitalia of this species were illustrated in the original description (1977, Figs. 1-3, 7).

Since the original description, a fall specimen was discovered that had been taken from Jasper Co., Mo.

Eupithecia coloradensis (Hulst) (Figs. 35-37)

Eupithecia strattonata, Heitzman, 1973.

The eighth sternite illustrated by McDunnough (1949, Fig. 4E) differs somewhat from ours in shape and does not show the hooked apices.

Eupithecia herefordaria Cassino & Swett (Figs. 26-28)

The eighth sternite illustrated by McDunnough (1949, Fig. 7E) does not compare well with those we observed; however, other characters suggest this is the correct placement.

Eupithecia swetti Grossbeck (Figs. 29-31)

The eighth sternite of McDunnough's figure (1949, Fig. 9E) shows some variability in the shape.

Eupithecia geminata Packard (Figs. 17-19)

The eighth sternite of McDunnough's figure (1949, Fig. 9F) differs slightly in shape and lacks the basal pits.

This species has been recorded over much of the Nearctic region, but never before in Missouri.

Eupithecia rindigei McDunnough (Figs. 23-25)

Eupithecia dichroma-johnstoni complex, Heitzman, 1973.

The clasper and aedeagus do not compare well with McDunnough's illustration (1949, Fig. 14H). The valve of the holotype is much longer, narrow, and more curved than in our observations. Also, the aedeagus appears longer, with a differently formed vesica.

This species was previously known only from California. It has now been taken as far east as central Missouri. These widely disjunct populations appear very similar when looking at the female genitalia and external characters. The primary is about 2 mm smaller in the western population. There is some doubt as to the correct taxonomic treatment of the Missouri population.

Eupithecia cocoata Pearsall

Eupithecia indistincta, Heitzman, 1973.

The male genitalia of this species were just recently illustrated (Heitzman and Enns, 1977). The female genitalia were illustrated by McDunnough (1949, Fig. 14I).

Horisme intestinata (Guenee) (Fig. 41)

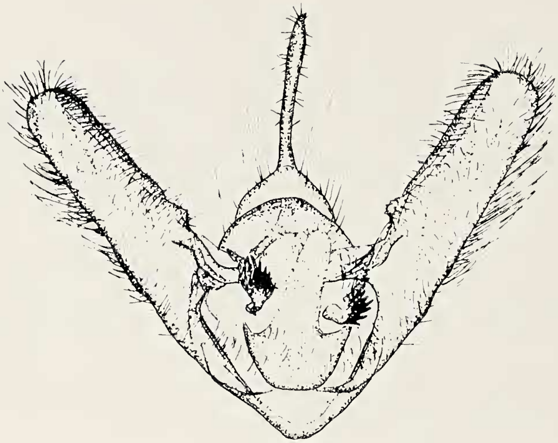
Apparently, the male genitalia of this species have not been illustrated before. Pierce (1914, Pl. 35) illustrated 4 European species of *Horisme.* They are close to each other, but show only vague relationships with *intestinata.*

Female with ostium wide, funnel-shaped, without striations; ductus bursae very long, becoming much wider than ostium, possessing a variable, dorsal lineof spines; bursa copulatrix a rather small sac, ⅓ size of the ductus bursae, embedded with many large spines.

Heterophleps triguttaria Herrich-Schaffer (Fig. 42)

Apparently, the male genitalia of this species have not been illustrated before. It is very close to *H. refusata* (Walker) but lacks the gnathos.

Female with ostium wide, membranous; ductus bursae short, with a terminal collar; neck of bursa copulatrix long, heavily sclerotized, with 6 longitudinal ridges; bursa sack oval-shaped, membranous; ductus seminalis arising from membranous tip of bursal neck.



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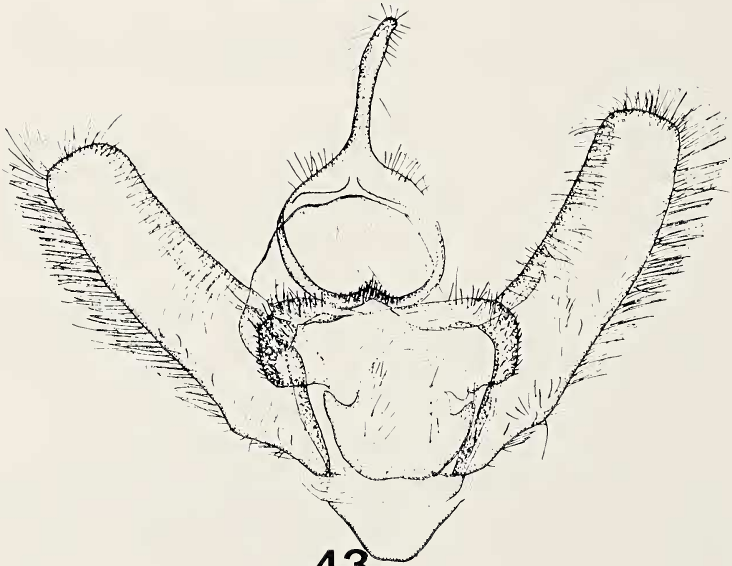

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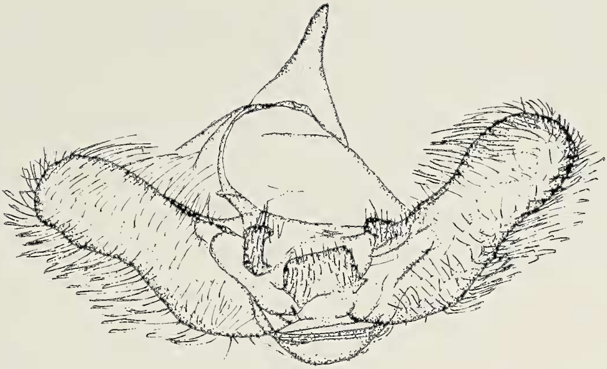
Fig. 42—*Heterophleps triguttaria* Herrich-Schaffer
Fig. 43—*Heterophleps refusata* (Walker)



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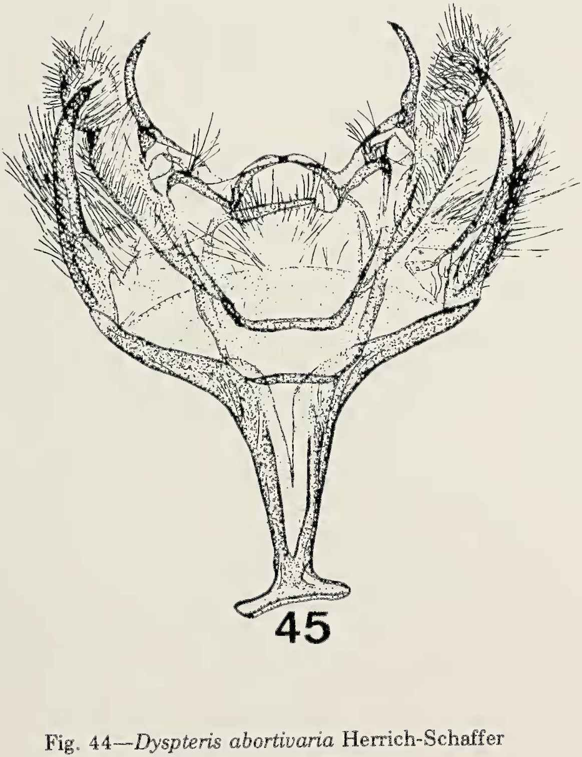

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Fig. 44—*Dyspteris abortivaria* Herrich-Schaffer
Fig. 45—*Eubaphe mendica* (Walker)

Heterophelps refusata (Walker) (Fig. 43)

Apparently, the male genitalia of this species have not been illustrated before. There appear to be good generic similarities.

Female with ostium wide, sclerotized on venter; ductus bursae short, membranous; bursa copulatrix very elongate, membranous, with a ring of 11 short, longitudinal ridges at proximal third, 9 of these protruding centrally with a flat, upcurving spine, 2 on left and 1 on venter without spines; ductus seminalis arising near ostium on right side.

Dyspteris abortivaria Herrich-Schaffer (Fig. 44)

Apparently, the male genitalia of this species have not been illustrated before. The genitalia are very simple and weakly sclerotized.

Female with ostium small, lightly sclerotized ventrally; ductus bursae short, membranous; bursa copulatrix oval, membranous.

Eubaphe mendica (Walker) (Fig. 45)

The genitalia have been previously illustrated by Fletcher (1954, Figs. 3, 18, 23, 51). Our illustration varies in nearly all respects, but there is considerable individual variation.

Eubaphe unicolor (Robinson)

The genitalia have been illustrated by Fletcher (1954, Figs. 17, 21, 48).No male specimens have yet been taken in Missouri.

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